

National Aeronautics and Space Administration

Office of Aerospace Technology

## Aerospace Technology Advisory Committee Meeting

February 26-27, 2003  
Washington, D.C.

### **MEETING REPORT**

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**Benjamin J. Neumann** (date)  
Executive Secretary

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**David O. Swain** (date)  
Chair

# AEROSPACE TECHNOLOGY ADVISORY COMMITTEE REPORT

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## **AEROSPACE TECHNOLOGY ADVISORY COMMITTEE MEETING MINUTES**

*Wednesday, February 26*

### **Welcome Remarks from the Chair**

Chair David Swain opened the meeting commenting about the difficult times for NASA in the wake of the Columbia accident. Jerry Creedon said what there was to do was contribute any ideas on what went wrong to Admiral Hal Gehman, help in the investigation and getting back to flight status where possible, and keep on doing one's job.

The change in the timing of the meetings to correspond with budget cycles was applauded as more useful for giving advice. In the 12 days previous to the meeting, the FY03 budget was approved, the FY04 budget was submitted, and guidance was provided for the FY05 budget.

### **Presentation of the Fiscal Year 2004 Budget**

#### Enterprise Overview

Jerry Creedon presented the changes in the baseline budget in line with the Aerospace Commission Final Report. The Commission recommended the transformation of the U.S. Air Transportation System as a national priority and an increase in the federal investment in basic aerospace research. Dr. Creedon will testify to Congress February 27 on the alignment of the budget with the Aerospace Commission final report. Based on external review, NASA realigned the International Space Station (ISS), Space Shuttle and Space Launch Initiative (SLI) so the programs are better integrated.

The Aerospace Technology Enterprise has four themes. Each theme has a different customer base and must have its own strategy. The budget has five mission-driven areas and two support areas. Aeronautics is one of the mission-driven areas under Science, Aeronautics and Exploration. The support areas are under Space Flight Capabilities. The SLI and the Mission and Science Measurement (MSM) Technology and Innovative Technology Transfer Partnerships fall under the Crosscutting Technology themes.

The FY04 budget reflects full-cost accounting, which Dr. Creedon explained briefly. The new budget reallocates money to support new initiatives: Aviation Safety and Security, National Airspace Systems Transition, and Quiet Aircraft Technology (plus \$4 million for a Unmanned Aerial Vehicle (UAV) initiative in the National Airspace). The SLI was reformulated with the life of the shuttle extended, more money allocated for science, and a flight rate of five shuttle flights per year. It took an amendment to the FY03 budget to accomplish this. The level 1 requirements for the Orbital Space Plane (OSP) have been approved by the whole agency.

Pioneering Revolutionary Technology (PRT) was changed to Mission and Science Measurement Technology after an external review by the National Research Council that endorsed the strong customer (science enterprises) orientation.

The technology transfer theme has been refocused from commercial spin offs to spin-in technology transfer, particular to NASA.

#### Aeronautics Technology Theme

Aeronautics Technology (AT) has three programs: Aviation Safety and Security, Airspace Systems Transition, and Vehicle Systems. Between the FY03 and FY04 budgets, a new initiative added security to Aviation Safety. The Office of Homeland Security requested help on screening technologies, and NASA is looking to see if they have something to offer.

In Airspace Systems, the Small Aircraft Transportation System Project (SATS) and Advanced Air Transportation Technologies (AATT) projects had planned ramp ups. AATT will transfer three tools to the FAA at the end of FY04. Some money was taken from the Virtual Airspace Modeling and Simulation Project (VAMS) for the NASA Exploratory Technologies for the NAS (NExTNAS) project. NASA took on these technologies as part of the planning activities for a joint program office with the FAA. The office will be looking at technologies for the National Airspace System (NAS) beyond 2020 to enable an integrated system of all users of the NAS. NASA's exploratory technologies for the NAS project include space-based communications and surveillance interoperability, wake vortex, air traffic management automation, and dynamic airborne procedures decision support tools. The joint FAA/NASA program office has signatories across six government agencies. The FAA/NASA Executive Committee includes the two agency administrators. DDR&E, the Office of Aviation Policy, and DOD would join in activities. One of the tasks of the joint program office will be to come up with a picture for the future of the airspace. NASA's

role would include looking at system-level concepts (VAMS), tools for airspace design and assessment, and system technologies.

The most change has occurred in Vehicle Systems (VS). New Aeronautical Missions was added as an objective, which primarily involves routine access in the NAS for UAVs for jobs that are better done without pilots. Tim Heely offered that the Navy was very interested in using UAVs and sharing information with NASA. VS took a large reduction to accommodate others. The Hyper-X Advanced Vehicle Concepts concludes with X-43A winding down. Environmental Research Aircraft and Sensor Technology (ERAST) flight research concludes. Other advanced vehicle concepts and break-through technology projects were cut. Money was added to the QAT project to transition technologies. The Federal Aviation Administration (FAA) has a \$15 million aircraft engine program that will be added to NASA's \$19 million on QAT.

The committee discussed NASA's role in advancing the NAS. Bob Spitzer offered that the 20 centers of excellence for transportation lack a vision of the larger picture. NASA might have a unique role to play in the larger integrated system architecture. NASA and its contractors have expertise in working very complex problems. Jerry Creedon suggested VAMS could help develop a guiding vision for how future elements might play into one airspace system.

Aeronautics Technology supports 3,000 Civil Servants (CS), which is one-sixth of the agency CS workforce, on one-fourteenth of the agency budget.

#### Space Transportation Technology Division Update

The new Integrated Space Transportation Plan (ISTP) includes the Space Shuttle, OSP, and Next Generation Launch Technology (NGLT). The new Space Architect is the keeper of the ISTP, which cuts across enterprises. Level 1 requirements are in development. The Core Complete configuration of the International Space Station (ISS) may be delayed with the Columbia accident. The ISS is an important laboratory and launching point. Its lifecycle may be extended to 2020.

John "Row" Rogacki described the OSP and NGLT programs. The OSP is intended to be the primary crew vehicle with a crew return rescue capability. The program has demonstrations for autonomous rendezvous technologies, pad abort, approach and landing. He went over the requirements and operational concepts for the OSP.

The NGLT program is well integrated with DOD and hypersonics through the National Aerospace Initiative (NAI). NGLT will pick up the X-43A and X-43C from Aeronautics Technology and the Air Force for flight demonstration.

The committee discussed the management structure. Center directors are responsible for projects that their Center is the lead on. Headquarters has assistant project managers at the centers to ensure coordination. Representatives from each Center participate in the ISTP. Findings that managing programs put Center directors in a conflict of interest resulted in program management being moved to NASA Headquarters.

Particularly since the Columbia accident, there is tremendous interest in accelerating OSP. They are looking at what that would take. The committee looked at the critical high-profile demonstrators and questioned NASA's integration with the DOD programs. They suggested creating a roadmap for the demonstrators (Defense Advanced Research Projects Agency (DARPA) Orbital Express, NASA Demonstration of Autonomous Rendezvous Technologies (DART), the X-43 programs, SSX-11) that included both agencies.

The committee looked at the OSP and NGLT in the context of the traffic model for the whole system, including the ISS, and configurations for transport and crew rescue. They commended NASA on the level 1 requirements.

#### Mission and Science Measurement Technology

Chris Moore presented the programs addressing the theme objectives: Engineering for Complex Systems (ECS), Enabling Concepts and Technologies (ECT), and Computing, Information and Communications Technology (CICT). This theme is narrowly focused to support in-house exploratory research. Formal external interfaces include the Space Technology Alliance (STA) and the Space Experiments Review Board (SERB). An NRC review in June recommended increasing external peer review and concluded that 90% of the program content was relevant. Three projects were killed and one reallocated. The committee wanted to see a chart on decision gates to select and filter the technologies to be moved forward into the enterprises. They suggested a more formal, structured process with external review.

ECS was discussed in the context of the Revolutionize Aviation Subcommittee (RAS) recommendation to facilitate avionics and other software certification for the NAS, for NASA's role in concept development for the NEXTNAS, and for the Space Shuttle enterprise. ECS's Investigation Organizer Tool was used successfully on the Comet Nucleus Tour (CONTOUR) investigation and is being used on Columbia.

Chris Moore explained the Advanced Lidar Instrument Technology initiative jointly funded by both Codes R and Y for expanding measurements in the troposphere by lasers. There was interest in expanding the applications. Ron Swanda had some ideas.

The team has been focusing on building stronger organizational bridges. They have incorporated the results of external reviews to change how they review and determine program content. The result is a more credible program focused on national needs, whose technologies other enterprises are finding useful.

#### Innovative Technology Transfer Partnerships Theme

Robert Norwood reviewed the technology transfer program theme and the changes in reformulating from a spin-off to a spin-in philosophy. The major part of the budget, \$11.3 million, goes to activities required of NASA by regulation. Enterprise Engine is a new initiative to use a venture capital approach to partnering with private firms to develop spin-in technologies that will directly benefit NASA as well as private industry. The initiative is managed at the headquarters level, but the money is in the theme's budget. The activities of the National Technology Transfer Center will be refocused to maximize return on investment. The theme has a legislative initiative seeking authority for copyrighting computer programs at a level on par with other technology innovations. NASA's Small Business Innovative Research (SBIR) program is getting additional focus on Phase III. Money from Phase I and II is being reallocated to seed Phase III projects to reduce the time and increase the volume of projects that find matching industry money and transfer to useful products.

### **Enterprise Report**

Jerry Creedon reviewed the changes in the themes that flow down from the NASA Strategic Plan. He asked the subcommittees to review the theme objectives, given the theme.

Project documentation that binds Dr. Creedon to the Administrator is the Integrated Budget and Performance Document (IBPD). Each project in an implementation phase (Hyper-X or X-43A and ERAST, for example) has its own document containing the budget, milestones, work years, etc. That is the program control document.

On the action items from last time, Dr. Creedon reported actions taken to clarify systems engineering tools they had available to use. NASA has conducted workshops toward ensuring they are taking advantage of best practices. NASA is looking at wind tunnels, and he wants to see one pricing structure for users. Dr. Creedon is committed to the process of reporting to the committee. He would like to do better next time and requested the committee be clear and write down requests for action.

There was some discussion of transitioning to full-cost accounting, dealing with OMB's perception that only procurements are the research budget, and optimizing operations under CS rules, issues that might come up at the NASA Advisory Council (NAC).

### **Facilities Topics and the RAND Study**

#### NATA Facility Information and the Congressionally Mandated Facility Study

Blair Gloss briefed the committee on the National Aeronautics Test Alliance (NATA). NATA was chartered to manage the government's aeronautic facilities at Arnold Engineering Development Center and Glenn, Langley and Ames research centers for DOD and NASA. They took 9 months to study the major supersonic, transonic, and aeropropulsion facilities and recommended closures and mothballing some test cells and Langley's 16TT. Most of their recommendations will be done by the end of FY04. A couple of targeted facilities will remain open.

More could be done to close and update facilities if NASA and DOD could rely on each other's facilities. The other issue was different Centers came up with different cost accounting and pricing policies. The general policy is to recover full costs, but the chief financial officer (CFO) can waive costs, and the policies are implemented differently.

The committee discussed representation on the NATA for industry and the various military services.

#### Congressionally Mandated Study of NASA's Aeronautical Test and Evaluation Facilities

The RAND study is looking at policy options for NASA to support national needs for research, development, test, and evaluation (RDT&E) of aeronautical facilities. The study is trying to look at the larger framework of tactical (specific programs) and strategic issues, including international facilities, by vehicle class.

They are looking at management structures as part of mapping needs to capabilities. They are looking not only at utilization, but the value of risk reduction, commercialization, the trade offs with computational fluid dynamics (CFD), and other issues.

They are trying to balance realistic advisors with visionaries looking 30 to 50 years out. They are talking with the auto industry on the use of the wind tunnels and asking if there are future forces that could change the big picture. Philip Anton volunteered to return to brief the committee when the report was complete.

## **Subcommittee Reports**

### Revolutionize Aviation Subcommittee

Ron Swanda presented the findings of the RAS. The subcommittee commended NASA's participation in the airspace program, affirming that NASA has a major research responsibility for NAS modernization. The subcommittee noted the difficulty of managing programs with 20-year transitions in 5-year program cycles and recommended NASA work to keep a strategic view. There was concern the VAMS program was being oversold. The subcommittee recommended a strategic planning effort and intellectual renewal plan for aeronautics human factors. The importance of the Small Aircraft Transportation System (SATS) project to industry is reflected in the money they put up. NASA needs to take some management leadership.

The RAS concurred with the Aviation Safety Task Force recommendation to charter the existing Aviation Safety Program Executive Council (AvSPEC) as a NASA advisory committee since it already exists to review the NASA safety program. The Vehicle Systems Task Force, rather than focus on outcomes, ended up helping NASA with their redefinition and reorganization process for VS. The RAS recommended the task force be continued to finish its work of reviewing VS when their process was complete. Dr. Creedon stated that the first VS briefing on the new organization would be presented to the ATAC the next day and would be briefed to OMB Friday. The advisory committees could still influence the next budget cycle up until June.

Ron Swanda raised the issue of certification of software for systems and avionics to FAA standards. It is a major issue facing manufacturers and cuts across safety, vehicle, and airspace issues. Part of the problem is the gap between the computer science community and aeronautics designers. The RAS recommended NASA work with the FAA to develop an appropriate R&D program to develop software certification tools. Herman Rediess from the FAA added that getting innovation from the General Aviation (GA) community required expediting certification. He supported the concept of an R&D program, because he didn't know how to expedite certification. The FAA would like to support it. David Swain accepted the issue as a good problem for the ATAC to work on.

The next meeting for RAS will be late May/early June to support the June ATAC meeting. They are planning to meet in August/September to meet with the FAA's Research, Engineering and Development Advisory Committee (REDAC). Chair David Swain also plans to attend that meeting.

### Advanced Space Transportation Subcommittee

John "Row" Rogacki reported on the Advanced Space Transportation Subcommittee (ASTS). Their next meeting will be in Colorado Springs in May so they can hear from the Air Force. The subcommittee emphasized the multiple functions of the OSP besides crew rescue. It suggested the program accelerate initial operation capabilities, baseline autonomous mission capability, use matured technology and conservative design margins, and make the capability to haul cargo separate.

The NGLT was an important advance technology program, the only one addressing the whole picture of space flight and return from orbit. The subcommittee recommended maintaining a long-term perspective with an adequate funding profile, coordinating closely with the Space Architect, and maintaining cooperation with other agencies, especially DOD.

The ATAC asked how the In-Space Transportation program overlapped with Advanced Space Transportation. Row Rogacki will have to get those requirements from the Space Architect. They recommended developing a roadmap for OSP development in conjunction with the Air Force. The committee requested a briefing on the status of the technologies coming out of the programs.

*Thursday, February 27*

## **Discussion of Enterprise Strategy**

Jerry Creedon reviewed NASA's Strategic Plan and the linkages between the goals, themes, and enterprises. In general to get funding so they can do good work, they have to justify work to the agency, then to OMB, then to Congress. To get out of the agency, the work has to map to the goals the Administrator set in the Strategic Plan. To get through OMB, they focus on public good and national priorities. The National Airspace System (NAS) is a big priority.

The Aerospace Technology Enterprise should be pioneering technologies to bring them to a place where other people can use them. That is the measure. They need to be transferring technology quicker through key partner

relationships with product users and be responsive to changes (including full-cost accounting). Their customer set is FAA, DOD, and industry. Space Transportation enables Code M. Mission and Science Measurement (MSM) Technology supports the science codes. OMB will be unhappy about NASA partnering with DOD, but there is a need to move to tactics that will enable the aerospace community to work together. They need to support and grow relationships to include the Department of Transportation, the Office of Homeland Security, and the Department of Commerce. Rich Wlezien in VS is setting an example of reaching out and coordinating with industry. The theme directors will have to focus on long-term, high-risk and high payoff (for society) technologies that industry wouldn't undertake.

In SLI, the OSP is very visible just behind the station and shuttle programs. The Space Architect reformulated NGLT last November. They have close cooperation with the DOD through the NAI. NASA needs to come up with more money to hold up their end of the partnership.

In MSM, they need to continue in high-end computing for NASA-unique applications and to structure computing and information technology investments to support science missions. Mission managers are under pressure not to take risks with new technologies. So this theme has to work on technology the science enterprises can use that enables capabilities beyond current mission plans. ECS is particularly ripe for growth since Columbia. David Swain recommended going way out in risk management and looking for a home-run technology. Columbia might create pressure to be risk adverse.

Jerry Creedon presented eight new initiatives for the Enterprise and asked the committee to evaluate them.

### **Vehicle Systems Program Planning Update**

Richard Wlezien presented the new thinking and organization for the Vehicle Systems theme. He addressed the idea of innovation, S curves, and how past investments enabled today's transportation systems. His theme is focused on objectives for the public good: protect the environment, increase mobility, new aerospace missions, and national security. In the last, they are supporting more than leading.

He reviewed the activities and programs in support of the objectives. The committee discussed mobility and how to approach affordability and noise reduction. Safety should be added. They discussed the right arguments to make for vehicle systems, and they discussed airspace capability versus capacity. They looked at dual use technology.

Rick Wlezien presented 12 conceptual vehicle systems. They are working the biggest impact technology pieces across the conceptual vehicle frameworks to track to the goals. They discussed schedule and deliverables, and the committee gave Richard Wlezien feedback on the presentation for OMB.

### **Committee Discussion**

Members made comments and suggested agenda and action items for the next meeting. Ron Swanda suggested planning workshops with industry on certification of software for avionics and systems. He felt the SATS project needed management attention. The SATS subcommittee will review SATS for the next meeting. He will work to make sure the wind tunnel study includes GA and other research facilities like climate research at Eglin AFB. Jerry Creedon welcomed a list of those facilities important to industry. The name of the subcommittee should be changed to agree with the themes.

Bob Spitzer commented on how much more useful the meeting was when in synch with the budget instead of under budget constraints. He commended the team on showing better linkage with strategic goals. He recommended NASA look to industry and other agencies for lessons learned in going to full-cost accounting. Members of the ATAC will make themselves available for discussion and questions. He would have liked to see a little more in education, reflecting the new education code.

Linda Katehi compared NASA's constituency with the National Science Foundation (NSF). NSF popularized their mission by educating members of OMB, congressional staffers, and educators on their mission and its importance. They put out publications to staffers on improving quality of life and extending knowledge. Outreach is critical to external support. She recommended NASA roadmap research thematically to involve stakeholders and small research groups. The ATAC agreed Code R should benchmark NSF's management approach, advocacy for programs, and outreach to OMB and Congress.

Tim Healy made the point that the budget increase for DOD is buying things, not research. The research budget has not increased. He thought it was important to roadmap programs with DOD to see how both research efforts could complement development. He felt overlap was better than gaps.

Aaron Gellman cautioned about confusing security and safety. He wanted to hear more about whether the safety commitment NASA made to the FAA was eroding. For spin-in technologies, he recommended publishing performance specifications for the technology to let people come back if they had ways to beat those metrics. He was worried about the fuel cell mania. Hydrogen is an expensive fuel source. He felt there was an opportunity to contribute to security in the area of explosive protection systems. He was interested in hearing more about how

technologies would be transitioned for the FAA to take advantage of them. He advocated clarifying the mission for SATS and finding out who were allies (GA). He recommended, and the ATAC accepted, that the Aviation Subcommittee review the NASA/FAA safety strategy investment plan commitment and report back.

Fred Macino pointed out that industry had done a lot of work on risk management. He recommended benchmarking risk management processes, the environments in which it was applied, and the results to tease out lessons learned so NASA could jump ahead in developing techniques and tools. He recommended the committee form a tiger team to look at what has gone on in industry and newly privatized agencies who went to full-cost accounting to look at transition problems and unplanned requirements in a zero-sum budget. He mentioned work that has been done in industry and the FAA to get their arms around software certification in a combined ground/air system. A panel assessed the issue for the Wide Area Augmentation System (WAAS) and tried to extrapolate results to some GPS systems. The ATAC resolved to try to understand what role NASA could play in this arena.

Tom Brackey cautioned that spin-in technology does not lead to break throughs. The government does long-term, high-risk, sometimes high-payoff research. The Terms of Reference of the Commercial Technology Subcommittee needs to be re-examined. He advocated thinking big and being more proactive in selling programs. He recommended a systems engineering approach to life for complex systems: understanding boundary conditions and doing roadmaps.

Dev Banerjee wanted NASA—more than it had ever done before—to understand, communicate, and emphasize the concept of operations more than detailed technologies. He was interested in more clarity on the nature of NASA's interaction with DOD. He commended the NASA team on their plans and strategies and was interested in seeing the next step: processes and tasks to improve the execution of the goals, starting with level 1 requirements. He wondered what the metrics for the internally-driven MSM and technology transfer themes were and recommended raising the bar periodically.

Mark Anderson highlighted the opportunity in the unique challenges NASA was confronted with. The Columbia accident was an opportunity to rethink the fundamental concept of space transport. Through the OSP and NGLT, Aerospace Technology had a unique opportunity to do something about reshaping it. The ongoing changes in the Vehicle Systems theme can be reset through the special confluence of events.



## APPENDIX A

### AGENDA

Aerospace Technology Advisory Committee Meeting  
 Holiday Inn, 550 C St., SW, Washington DC  
 "Discovery II" Conference Room  
 February 26-27, 2003

#### Day 1

8:00	Welcome	Swain and Creedon
8:15	Presentation of the FY 2004 Budget	
	Enterprise Overview	Creedon
	Aeronautics Technology	Hertz
	Space Launch Initiative	Rogacki
	Mission, Science, Measurement Technology	Moore
	Commercial Technology	Norwood
10:45	BREAK	
11:00	Discussion	
12:00	LUNCH	
1:00	Enterprise Report	Creedon
	ATAC Actions	
	The Enterprise and the Columbia Investigation	
	Report on action items from last time	
2:45	BREAK	
3:00	Facilities Topics and the RAND Study	Gloss
4:00	Subcommittee Report	
	Revolutionize Aviation	Swanda
	Space Transportation	Rogacki
5:00	ADJOURN	

#### Day 2

8:00	Discussion of Enterprise Strategy	Creedon
9:00	Vehicles Systems Program – planning	Wlezien
10:00	Discussion and new action review	
12:00	ADJOURN	

**APPENDIX B  
AEROSPACE TECHNOLOGY ADVISORY COMMITTEE  
MEMBERSHIP**

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**APPENDIX C  
MEETING ATTENDEES**Committee Members

Dave Swain	Boeing
Mark Anderson	Boeing
Dev Banerjee	Boeing
T.A. Brackey	Boeing
Aaron Gellman	Northwestern University
T. Heely	USN
Linda Katehi	Purdue
John W. Olcott	NBAA
Herm Rediess	FAA
Bob Spitzer	Boeing
Ron Swanda	GAMA

NASA Attendees

Dennis Andrucyk	NASA Headquarters
Ted Biess	NASA
Ron Colantoni	NASA Glenn
Mingo Dastror	NASA
Rajiv Dorewamy	NASA
Dal Freeman	NASA Langley
Blair Gloss	NASA
Terrence Hertz	NASA
Jenny Kishiyama	NASA
Victor Lebacqz	NASA
Peter McCallum	NASA Glenn
Mary Ellen McGrath	NASA
Bob Mercure	NASA Headquarters
Chris Moore	NASA
Benjamin Neumann	NASA
Robert L. Norwood	NASA
Julie Pollitt	NASA
George Price	NASA Headquarters
Carl Ray	NASA
Dell Ricks	NASA
Row Rogacki	NASA
Odilyn Santa Maria	NASA Headquarters
Tony Springer	NASA
Charles Willits	NASA Headquarters

Other Attendees

Philip Anton	RAND
David Brandt	Lockheed Martin
Game Gritton	RAND
Tom Hopp	GAO
Bill Hoover	NRC
Andrew Lacher	MITRE
Fred Messina	Raytheon
M.I. Prentaken	GF
Joan Robinson-Berry	Boeing
Jennifer Travell	DFI

**APPENDIX D**  
**FINDINGS AND RECOMMENDATIONS**

**APPENDIX E**  
**LIST OF PRESENTATION MATERIAL<sup>1</sup>**

- 1) FY 2004 Budget: Enterprise Overview, Jerry Creedon
- 2) Aeronautics Technology Theme Update on FY 2004 Budget, Terrence J. Hertz
- 3) Space Transportation Technology Division Update, John Rogacki
- 4) Mission and Science Measurement Technology, Dennis Andrucyk
- 5) Innovative Technology Transfer Partnerships Theme, Robert Norwood
- 6) Enterprise Report, Jerry Creedon
- 7) National Aeronautics Test Alliance, Facility Information, and the Congressionally Mandated Facility Study, Bill Gloss
- 8) Congressionally Mandated Study of NASA's Aeronautical Test and Evaluation (T&E) facilities, Philip Anton, RAND
- 9) Revolutionize Aviation Subcommittee Report, Ron Swanda
- 10) Enterprise Strategy, Jerry Creedon
- 11) Vehicle Systems Program Planning Update, Richard Wlezien

Other Materials:

*Final Report of the Commission on the Future of the United States Aerospace Industry*

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<sup>1</sup> Presentation and other materials distributed at the meeting are on file at NASA Headquarters, Code R, Washington, D.C. 20546.